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VASCULAR FLORA OF KANE LAKE CIRQUE, PIONEER MOUNTAINS, IDAHO

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ABSTRACT.—Kane Lake Cirque lies in the western Pioneer Mountains of south central Idaho. An inventory of the high-elevation flora of the cirque revealed the presence of 180 vascular taxa representing 95 genera and 30 families. Five alpine taxa are here documented from Idaho for the first time: *Carex incurviformis* Mack., *Draba fladnizensis* Wilfen., *Potentilla nivea* L., *Ranunculus gelidus* Kar. & Kir., and *Ranunculus pygmaeus* Wahlenb. Kane Lake Cirque also contains populations of four additional alpine taxa considered to be of conservation concern in Idaho: *Erigeron humilis* Graham, *Parnassia kotzebuei* Cham., *Saxifraga adscendens* L., and *Saxifraga cernua* L.

Key words: Idaho, Pioneer Mountains, Kane Lake Cirque, alpine vascular flora, state records, rare flora.

Studies of alpine flora have been numerous throughout the North American Cordillera, but only recently have investigations of this kind been undertaken in Idaho. Floristic studies initiated by Douglass Henderson of the University of Idaho Herbarium in the mid-1970s were the first to systematically explore the alpine zone of Idaho. Through numerous collections, he and co-workers documented Idaho's alpine flora to be unique in many respects (Henderson 1978, Brunsfeld 1981, Henderson et al. 1981, Brunsfeld et al. 1983, Caicco et al. 1983, Lackshewitz et al. 1983, Hartman and Constance 1985). Nearly all these investigations took place in the large Basin and Range-like massifs in east central Idaho, with few extending into the western Pioneer Mountains of south central Idaho.

Rare plant inventories initiated by the U.S. Forest Service were the first to point out the phytogeographic importance of the cirques in the western Pioneer Mountains, in general, and Kane Lake Cirque, in particular (Caicco and Henderson 1981, Brunsfeld et al. 1983). Barbara Ertter's collections in 1977 and our collections in 1987 further highlighted the significance of Kane Lake Cirque. Because of increasing recreational use of the Kane Lake area, sensitivity of the habitats, and preliminary nature of the floristic inventory, we undertook this study in cooperation with the Challis National Forest to provide them with adequate data on the distribution and abundance of rare plants and habitats in the basin for future management.

STUDY AREA

The Pioneer Mountains rise abruptly from the northern edge of the Snake River Plain in central Idaho between the Big Lost and Big Wood rivers. These mountains form a large, complex block about 60 km long and 50 km wide, oriented northwest to southeast. Topography varies from sharp horns, serrate ridges, and broad upland surfaces in the alpine zone to steep-sided valleys and rounded ridges in the foothills. Elevations range from 1900 m in the valleys on the western slope to 3658 m at the summit of Hyndman Peak.

The Pioneer Mountains are composed of Tertiary Challis Volcanics consisting of interbedded lava and tuffaceous units, which lie unconformably over a core of Precambrian metamorphic and Paleozoic sedimentary units. During the formation of the Cretaceous Idaho Batholith, small "satellite" intrusive bodies were emplaced in the western Pioneer Mountains. Tertiary and Quaternary block faulting is believed to be the cause of the subsequent uplift and present relief (Dover 1981). The geomorphologic setting has been greatly influenced by Quaternary glacial and fluvial activity. Most streams in glaciated valleys are underfit, and

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uplands display classic alpine-type glaciated features including cols, aretes, horns, and cirques (Evenson et al. 1982).

The Pioneer Mountains lie in a transition zone between the maritime climate of northern and western Idaho and the continental climate of southeastern Idaho, and are affected by two basic storm patterns. From November through March most precipitation comes from low-altitude cyclonic storms that move eastward from the Pacific Ocean. During May and June most precipitation results from high-altitude convectional storms moving northward from the Gulf of Mexico and California coast. The combination of maritime and continental influence creates two wet seasons, winter and late spring, respectively (Caicco 1983). No climatic data are available from high elevations in the Pioneer Mountains; however, Moseley (1985) estimates mean annual precipitation at 2835 m in the southern part of the range to be 813 mm. Throughout the mountainous regions of the world, the altitude of upper treeline has long been observed to coincide with the 10 C isotherm of the warmest month (Griggs 1937, Daubenmire 1954, Wardle 1974). Extrapolation of temperatures from valley stations in the vicinity to timberline (3000 m) using an adiabatic lapse rate of 0.62 C/100 m (Baker 1944) substantiates this observation for the Pioneer Mountains.

Description of Kane Lake Cirque

Kane Lake Cirque encompasses approximately 567 ha at the head of Kane Creek in the western Pioneer Mountains 21 km northeast of Ketchum, Custer County, Idaho (43°44′N 114°6′W; T5N R20E, Boise Meridian). The cirque is characterized by permanent snowfields, glacially scoured bedrock (gneiss and quartz diorite), and unstable talus and morainal deposits. Although several small ponds are scattered throughout the basin, 5.3-ha Kane Lake is the only large body of water. Elevations of the study area range from 2800 m to 3648 m. The only appreciable soil development is in depositional areas such as along streams and rivulets, around ponds and lakes, and in the coniferous woodland on the north side of Kane Lake.

Vegetation in the cirque reflects a moister regime than has been noted at high elevations elsewhere in Idaho (Brunsfeld 1981, Caicco 1983, Moseley 1985). This mesic environment can be attributed to several factors, including the north-facing orientation of the cirque, a massive headwall on the south, and high peaks on the east, south, and west sides of the basin. These features contribute collectively to a heavy snow accumulation in the winter and its retention throughout the summer. Late-lying snow and an impermeable substrate, augmented by summer thundershowers, appear to provide plentiful moisture to nearly all habitats throughout the growing season, except the south-facing slopes north of Kane Lake.

Habitats in the cirque can be divided into two distinct groups: subalpine and alpine. Subalpine vegetation is restricted to areas immediately adjacent to Kane Lake and generally does not exceed 2850 m. Alpine habitats cover most of the area and are generally sparsely vegetated, although small areas with continuous vegetative cover occur along streams and rivulets throughout the basin and contain much of the plant species diversity of the alpine zone. Plant associations of the study area are not included in published vegetation classifications of the region and are subjectively characterized below.

Subalpine Communities

Coniferous woodland. Open stands of *Pinus albicaulis* Engelm., with lesser amounts of *Abies lasiocarpa* (Hook.) Nutt. and *Picea engelmannii* Parry, occupy the level bench north of Kane Lake. The relatively xeric understory is characterized by *Vaccinium scoparium* Leiberg, *Poa nervosa* (Hook.) Vasey, and *Senecio streptanthifolius* Greene.

Upland meadows. Interspersed in low-lying areas within the coniferous woodland are meadows dominated by graminoids and forbs. Species characteristic of these sites include *Festuca idahoensis* Elmer, *Danthonia intermedia* Vasey, *Erigeron simplex* Greene, *Carex microptera* Mack., and *Potentilla diversifolia* Lehm.

Tree islands and krummolz. Isolated tree islands, consisting of small, upright *Abies lasiocarpa* with an understory dominated by *Phyllodoce* spp., occur as high as 3050 m on benches south of the lake. These relatively moist sites are surrounded by bedrock or alpine meadow communities. Areas of krummholz are rare in the study area. Small isolated patches consisting of low-growing *A. lasiocarpa* and

Pinus albicaulis occur as high as 3230 m on the steep south-facing slopes north of Kane Lake.

Lakeside meadows. Surrounding Kane Lake and radiating out along inlet and outlet streams are meadows that have soil saturated to the surface and are high in organic matter. *Carex scopulorum* Holm is dominant here along with scattered forbs, such as *Erigeron peregrinus* (Pursh) Greene, *Senecio cymbalarioides* Buek., and *Gentiana calycosa* Griseb. Low shrubs, including *Salix planifolia* Pursh and *Ledum glandulosum* Nutt., occur occasionally in these meadows.

Alpine Communities

Meadows. This mesic community is limited in extent and generally occurs in isolated patches around seeps or as stringers along streams and rivulets. *Deschampsia cespitosa* (L.) Beauv. is by far the dominant species here, with a high diversity of forbs and other graminoids occurring in low cover.

Cliffs and ledges. This is the most common community in the cirque. Most cliffs and ledges are north-facing and wet to mesic, with *Draba lonchocarpa* Rydb. being the most constant species, along with several species of *Saxifraga*. The xeric counterparts occur only on the south-facing slopes northeast of Kane Lake and have few vascular plants.

Talus and scree. Common at upper elevations in the cirque, this relatively mesic community is characterized by a unique suite of species able to withstand constantly shifting substrates. Species characteristic of material greater than 5 cm in diameter (talus) include *Hulsea algida* Gray and *Senecio fremontii* T. & G., while *Saxifraga cernua* L., *Luzula spicata* (L.) DC., and *Androsace septentrionalis* L. characterize small-diameter material (scree).

Fellfield. Dry fellfield habitats are rare, occurring only in small pockets on bedrock slabs on the cirque floor east of Kane Lake. Species typical of this poorly developed community include *Potentilla brevifolia* Nutt., *Juncus drummondii* E. Meyer, and *Sibbaldia procumbens* L. *Carex elynoides* Holm also occurs in this community but does not develop into the extensive turfs that are found elsewhere in central Idaho (Caicco 1983). All ridges surrounding the basin, typical sites for fellfield communities elsewhere in the state, are sharp aretes with no well-developed vegetation.

METHODS

The checklist is based on 263 collections, made mostly by the authors in July and August 1987 and July 1991. Other collectors include Barbara Ertter, who visited Kane Lake in July 1977, and Steven Caicco, who collected in the cirque during July 1981 and August 1982. A nearly complete set of specimens is deposited at the University of Idaho Herbarium (ID), with duplicates distributed widely. Ertter's collections are deposited at the Albertson College of Idaho (CIC).

Collections thought to be new records for Idaho were confirmed by experts in a particular taxon and/or from a search of up to 59 local, regional, and national herbaria (Moseley 1989). Range-extension data for these state-record taxa were determined from herbarium records and from the atlases and data bases maintained by the Idaho Conservation Data Center and Montana Natural Heritage Program on the location, distribution, numbers, and condition of rare plant populations in their respective states (Jenkins 1986). The Idaho Conservation Data Center data base was also consulted concerning the current distribution of additional rare species in Idaho.

RESULTS AND DISCUSSION

The vascular flora of Kane Lake Cirque consists of 180 species representing 95 genera in 30 families of pteridophytes, gymnosperms, and angiosperms. Of these, 53 species (29%) are restricted to subalpine communities in the cirque, while 58 species (33%) are restricted to alpine habitats. The remaining 69 species (38%) transcend the subalpine-alpine boundary and occur in both types of communities. Our collections of five species from the study area represent their first documented occurrence in Idaho. In addition, four other arctic-alpine species are known from Idaho from only a few occurrences and are considered rare in the state (Moseley and Groves 1990). Only one alien taxon, *Taraxacum officinale* Weber, was found in the study area.

Taxa New to Idaho

***Carex incurviformis* Mack.** This species occurs in two areas of the North American Cordillera: var. *incurviformis*, known from the Rocky Mountains of British Columbia, Alberta,

Montana, and now Idaho; and var. *danaensis* (Stacey) Hermann, occurring in the southern Rocky Mountains of Colorado and the Sierra Nevada and White Mountains of California (J. Mastrogiuseppe, Washington State University, personal communication, 1991). The population in Kane Creek is disjunct south from the next closest known population in Deer Lodge County, Montana, by about 260 km (*Lackschewitz 3938* MONTU; Lesica and Shelly 1991). We found one small population in the Kane Lake Cirque, occurring in a steeply sloping meadow on seepy ledges at 3350 m at the southern end of the cirque.

***Draba fladnizensis* Wilfen.** A widespread circumpolar species, *Draba fladnizensis* is sparsely distributed in North America, from the arctic south through the Rocky Mountains to Utah and Colorado (Hitchcock 1941). As with *Carex incurviformis*, the Kane Lake Cirque population is disjunct south from the next closest known population in the Storm Lake area of the Pintlar Range, Deer Lodge County, Montana, by about 260 km (*Lackschewitz 6120* MONTU). Several very small populations occur on ledges and in rocky areas south of Kane Lake, including spray zones of waterfalls, bare stream gravels, and on steep, rocky slopes near seeps.

***Potentilla nivea* L.** This circumpolar species occurs in arctic and alpine regions of North America, being previously known in western North America from Alaska south along the main crest of the Rocky Mountains to Montana, Wyoming, Colorado, and Utah and east to Nevada (Hitchcock and Cronquist 1973). The Kane Lake Cirque population is disjunct from the nearest Montana populations by perhaps 280 km. A small population of about a dozen plants was seen in a moist, sloping meadow at the top of the waterfalls south of Kane Lake at 2950 m.

***Ranunculus gelidus* Kar. & Kir.** A North American endemic, this species is distributed across the arctic, southward in the Rocky Mountains to Colorado (Benson 1948). The very small population in Kane Creek Cirque represents a disjunction southwestward of about 350 m from the Beartooth Plateau, Stillwater County, Montana (*Stickney 4* MRC; Lesica and Shelly 1991). In the study area it occurs in a stringer of *Deschampsia cespitosa* along the northeastern tributary of Kane Lake at about 3170 m.

***Ranunculus pygmaeus* Wahlenb.** This buttercup is circumpolar, occurring south along the Rocky Mountain crest to Colorado (Benson 1948). Its presence in the Kane Lake Cirque represents a disjunction of about 200 km southwest from the next nearest known populations in the Pioneer Mountains, Beaverhead County, Montana (*Hitchcock and Muhlick 12899* WS). *Ranunculus pygmaeus* is relatively common in the Kane Lake Cirque, occurring in moist, exposed soil along creeks, on ledges and slopes, and occasionally in cracks in cliffs.

Additional Rare Species

***Erigeron humilis* Grahm.** This circumpolar species was not known from Idaho until Henderson et al. (1981) reported it from the Lemhi and Lost River ranges. Eight occurrences are now known from the state, with the Kane Lake Cirque populations being the only ones known outside the two ranges mentioned above (unpublished data on file at the Idaho Conservation Data Center, Boise). *Erigeron humilis* is relatively common in moist *Deschampsia cespitosa* meadows throughout the lower portion of the cirque.

***Parnassia kotzebuei* Cham.** This species was also not known from Idaho until recently when Brunsfeld et al. (1983) reported it from the Lost River Range and Pioneer Mountains. Four occurrences are now known from the state (unpublished data on file at the Idaho Conservation Data Center, Boise). It is relatively common on moist ledges and in sloping *Deschampsia cespitosa* meadows throughout the lower portion of the cirque.

***Saxifraga adscendens* L.** The North American representative of this wide-ranging species, var. *oregonensis* (Raf.) Breit., occurs throughout the Rocky Mountains and northern Cascade Range (Hitchcock and Cronquist 1973). In Idaho it is known from nine sites in the White Cloud Peaks, Pioneer Mountains, and Lost River Range (unpublished data on file at the Idaho Conservation Data Center, Boise). Kane Lake Cirque populations occur throughout the area on moist scree, sand, and gravel, often along streams.

***Saxifraga cernua* L.** Seven small populations of this circumboreal species are known from Idaho (unpublished data on file at the Idaho Conservation Data Center, Boise). At Kane Lake Cirque it is widely scattered in small populations from moist subalpine ledges north of Kane Lake at 2800 m to ledges and cracks on the headwall at 3400 m.

ANNOTATED CHECKLIST OF VASCULAR PLANTS

The checklist is arranged by division and class (in Magnoliophyta), then alphabetically by family, genus, and species within these major groupings. Nomenclature generally follows Hitchcock and Cronquist (1973), exceptions being *Salix* (Brunsfeld and Johnson 1985), *Carex incurviformis* and *C. scopulorum* var. *bracteosa* (Hermann 1970), and *Eriogonum capistratum* (Reveal 1989). Unless otherwise noted, the collection numbers are the authors'.

DIVISION LYCOPODIOPHYTA

Selaginellaceae

***Selaginella densa* Rydb.** Common in subalpine and alpine zones; moist to dry slopes and ledges and stabilized scree. 2245.

DIVISION POLYPODIOPHYTA

Polypodiaceae

***Cryptogramma crispa* (L.) R. Br.** Uncommon in moist subalpine and alpine talus; circumboreal. 2292.

***Cystopteris fragilis* (L.) Bernh.** Common among rocks in moist alpine sites; circumboreal. 2294.

***Pellaea breweri* D.C. Eat.** Uncommon in subalpine and alpine zones; stabilized scree, rocky ledges, and boulder fields. 2293.

***Woodsia scopulina* D.C. Eat.** Common on rocks in subalpine zone. 2252.

DIVISION PINOPHYTA

Cupressaceae

***Juniperus communis* L. var. *montana* Ait.** Rare on dry ledges of lower alpine zone and in krummholz. 2355.

Pinaceae

***Abies lasiocarpa* (Hook.) Nutt.** Common in woodland and krummholz communities. 2392.

***Picea engelmannii* Parry.** Common in woodland and krummholz communities. 2391.

***Pinus albicaulis* Engelm.** Common in woodland and krummholz communities. 2263.

DIVISION MAGNOLIOPHYTA

CLASS MAGNOLIOPSIDA

Apiaceae

***Lomatium idahoense* Math. & Const.** Rare in disturbed microsites in moist subalpine meadows north of Kane Lake. 2256.

***Osmorhiza chilensis* H. & A.** Uncommon in deep soil of forest understory. 2376B.

Asteraceae

***Achillea millefolium* L. ssp. *lanulosa* (Nutt.) Piper var. *alpicola* (Rydb.) Garrett.** Common on dry subalpine and alpine slopes. 2262.

***Agoseris aurantiaca* (Hook.) Greene.** Uncommon in subalpine meadows north of Kane Lake. 2387.

***Antennaria alpina* (L.) Gaertn. var. *media* (Greene) Jeps.** Common in moist, sandy soil in alpine zone. 1186, 2336.

***Antennaria dimorpha* (Nutt.) T. & G.** Rare in dry forest opening north of Kane Lake. 2393.

***Antennaria microphylla* Rydb.** Common on dry subalpine and alpine slopes. 2244.

***Antennaria umbrinella* Rydb.** Common in dry to moist subalpine and alpine meadows. 2308, 2312.

***Arnica latifolia* Bong. var. *gracilis* (Rydb.) Cronq.** Common in deep soil of subalpine and alpine slopes and boulder fields. 2246.

***Arnica mollis* Hook.** Common in moist subalpine and lower alpine meadows and boulder fields. 1177, 2319, 2343.

***Artemisia michauxiana* Bess.** Uncommon in moist, unstable, rocky drainage bottoms; subalpine and lower alpine zones. 2363.

***Artemisia tridentata* Nutt.** Rare on dry subalpine slopes north of Kane Lake. 2261.

***Aster alpigenus* (T. & G.) Gray var. *haydenii* (Porter) Cronq.** Dry openings in forest north of Kane Lake. 2419.

***Aster foliaceus* Lindl. var. *apricus* Gray.** Common in moist alpine meadows east of Kane Lake. 1175.

***Aster stenomeres* Gray.** Dry, rocky ledges in forest openings north of Kane Lake. 2235.

***Chaenactis alpina* (Gray) Jones.** Uncommon in subalpine and alpine dry, sandy scree. 2361.

***Cirsium tweedyi* (Rydb.) Petr.** Common in moist meadows and on ledges in alpine zone. 2378.

***Erigeron acris* L. var. *debilis* Gray.** Common in moist, sandy soil; subalpine and alpine zones. 1183, 2287, 2344.

***Erigeron asperuginus* (Eat.) Gray.** Dry slopes and ledges; common in subalpine and uncommon in lower alpine zones. 2250, 2350.

***Erigeron compositus* Pursh var. *glabratus* Macoun.** Common on dry subalpine and alpine ledges. 2265.

***Erigeron coulteri* Porter.** Rare in alpine meadows along creek east of Kane Lake. 1174.

***Erigeron humilis* Graham.** Locally common in moist alpine meadows. 2274, 2410; Caicco 284.

***Erigeron peregrinus* (Pursh) Greene ssp. *callianthemus* (Greene) Cronq. var. *scaposus* (T. & G.) Cronq.** Common in moist to wet subalpine meadows around Kane Lake. 2306, 2367.

***Erigeron simplex* Greene.** Common in subalpine and alpine zones; moist meadows and slopes. 1188, 2270, 2338; Caicco 476; Ertter 2108.

***Haplopappus lyallii* Gray.** Uncommon on dry alpine ledges. 2402.

***Haplopappus macronema* Gray.** Uncommon on dry subalpine knoll, within forest north of Kane Lake. Not collected.

***Haplopappus suffruticosus* (Nutt.) Gray.** Uncommon on dry subalpine knoll, within forest north of Kane Lake. Not collected.

***Hieracium gracile* Hook.** Uncommon in dry forest openings north of Kane Lake. 2305.

***Hulsea algida* Gray.** Common in alpine talus. 2403.

***Microseris nutans* (Geyer) Shultz-Bip.** Uncommon in subalpine meadows north of Kane Lake. 2385.

***Senecio cymbalarioides* Buek.** Common in moist subalpine and alpine meadows. 1173.

***Senecio fremontii* T. & G. var. *fremontii*.** Common in alpine talus. 2400.

***Senecio streptanthifolius* Greene.** Common in subalpine zone; dry slopes and forest understory. 2255.

***Solidago multiradiata* Ait. var. *scopulorum* Gray.** Dry, rocky subalpine and alpine ledges. 2258.

***Taraxacum lyratum* (Ledeb.) DC.** Common in alpine zone; moist meadows and slopes. 1185, 2289.

***Taraxacum officinale* Weber.** Alien; rare in subalpine meadows north of Kane Lake. 2388.

Boraginaceae

***Mertensia ciliata* (Torr.) G. Don.** Common along subalpine and lower alpine rivulets. 2268.

Brassicaceae

***Arabis* sp.** Immature and unidentifiable to species. Uncommon in dry to moist forest openings north of Kane Lake. 2375.

***Arabis lemmonii* Wats. var. *lemmonii*.** Common on dry, unstable alpine slopes. 2313, 2356.

***Arabis microphylla* Nutt. var. *microphylla*.** Common on subalpine ledges and slopes north of Kane Lake. 2248.

***Arabis microphylla* Nutt. var. *saximontana* Rollins.** Uncommon in moist soil of alpine zone. 2374.

***Draba* sp.** Unable to identify; possibly a new taxon. Rare; seen only in one small, steeply sloping, moist meadow at 3353 m, east of Kane lake. 2412.

***Draba fladnizensis* Wilfen.** Circumpolar; rare on disturbed, bare-soil microsites of steep alpine slopes and along rivulets. 1107.

***Draba lonchocarpa* Rydb. var. *lonchocarpa*.** Common throughout cirque on moist ledges and slopes; alpine zone. 1106, 2314; Ertter 2106.

***Draba oligosperma* Hook. var. *oligosperma*.** Rare on dry alpine slopes and ledges. 2357, 2362; Ertter 2102.

***Draba paysonii* Macbr. var. *treleasii* (Schulz) Hitchc.** Uncommon in dry, sandy alpine soil. 2405.

***Erysimum asperum* (Nutt.) DC.** Rare in dry subalpine talus north of Kane Lake. 2377.

***Smelowskia calycina* (Steph.) C.A. Mey. var. *americana* (Regel & Herd) Drury & Rollins.** Uncommon on dry, exposed alpine slopes 2349; Ertter 2107.

Caryophyllaceae

***Arenaria aculeata* Wats.** Dry, sandy slopes; common in subalpine and rare in alpine zone. 2236, 2351.

***Arenaria congesta* Nutt.** Uncommon on dry alpine slopes east of Kane Lake. 1187.

***Arenaria obtusiloba* (Rydb) Fern.** Dry, exposed slopes and ledges; common in alpine and uncommon in subalpine zone. 2354.

***Arenaria rubella* (Wahlenb.) J.E. Smith.** Circumboreal; uncommon on moist to dry alpine ledges. 2424.

***Cerastium beringianum* Cham. & Schlecht.** Common in alpine zone throughout cirque; moist slopes, meadows, and ledges. 2321, 2413.

***Sagina saginoides* (L.) Britt.** Circumboreal; uncommon in moist alpine meadows. 1179, 2260.

***Silene douglasii* Hook. var. *douglasii*.** Dry, rocky ledges; uncommon in subalpine and lower alpine zone. 2364.

***Silene repens* Pers. var. *australe* Hitchc. & Mag.** Damp, long rocks of boulder field east of Kane Lake. Caicco 486.

***Stellaria longipes* Goldie var. *altocaulis* (Hulten) Hitchc.** Uncommon in moist, sandy sites and scree in alpine meadows. 1180, 2327.

***Stellaria umbellata* Turcz.** Rare in wet to moist gravels along alpine rivulets. 2326, 2347.

Crassulaceae

***Sedum lanceolatum* Torr. var. *lanceolatum*.** Common on moist to dry subalpine and alpine slopes and ledges. 2240.

Ericaceae

***Kalmia microphylla* (Hook.) Heller.** Common in moist to wet subalpine and alpine meadows. 2304.

***Ledum glandulosum* Nutt. var. *glandulosum*.** Common in moist subalpine forest and meadows around Kane Lake. 2303.

***Phyllodoce empetriformis* (Sw.) D. Don.** Common on moist subalpine and alpine slopes. 2300.

***Phyllodoce glandulifera* (Hook.) Cov.** Common on moist subalpine and alpine slopes. 2302.

x ***Phyllodoce intermedia* (Hook.) Camp.** Common on moist subalpine and alpine slopes. 2301.

***Vaccinium scoparium* Leiberg.** Common in dry sites in understory of forest and krummholz. 2237.

Fabaceae

***Astragalus alpinus* L.** Circumboreal. Common in moist meadows throughout cirque; subalpine and alpine zones. 2318, 2373; Caicco 474.

***Astragalus eucosmus* Robins.** Rare in cracks of moist cliff near stream; alpine zone. 2396.

***Astragalus kentrophyta* Gray var. *implexus* (Canby) Barneby.** Common on exposed, dry alpine slopes and ledges. 2352; Ertter 2102.

***Trifolium longipes* Nutt. var. *pedunculatum* (Rydb.) Hitchc.** Uncommon in deep soil along subalpine streambank north of Kane Lake. 2380.

Gentianaceae

***Frasera speciosa* Dougl.** Uncommon in dry subalpine talus north of Kane Lake. 2415.

***Gentiana calycosa* Griseb. var. *asepala* (Maguire) Hitchc.** Common in moist subalpine and low alpine meadows. 1172.

***Gentiana prostrata* Haenke.** Rare; seen only in moist, steeply sloping meadow above ponds east of Kane Lake; alpine zone. 2408.

Grossulariaceae

***Ribes cereum* Dougl. var. *inebrians* (Lindl.) Hitchc.** Uncommon in subalpine and alpine zones; dry ledges and boulder fields. 2409.

***Ribes hendersonii* Hitchc.** Rare and local in dry boulder field east of Kane Lake; alpine zone. 2416.

***Ribes lacustre* (Pers.) Poir.** Uncommon along subalpine creek near outlet of Kane Lake. 2398.

***Ribes montigenum* McClatchie.** Common in boulder fields and dry forest understory; subalpine zone. 2310.

Hydrophyllaceae

***Phacelia hastata* Dougl. var. *alpina* (Rydb.) Cronq.** Uncommon in moist to dry alpine talus. 2406.

Onagraceae

***Epilobium alpinum* L. var. *alpinum*.** Common on moist, unstable subalpine and alpine slopes; circumboreal. 2333.

***Epilobium angustifolium* L.** Rare in dry forest opening north of Kane Lake. 2418.

Epilobium glaberrimum* Barbey var. *fastigiatum

(Nutt.) Trel. Uncommon in moist meadow along stream east of Kane Lake; alpine. 2258.

***Oenothera andina* Nutt.** Rare in disturbed microsites in dry subalpine meadows north of Kane Lake. 2264.

Polemoniaceae

***Phlox pulvinata* (Wherry) Cronq.** Common on dry, exposed alpine slopes. 2348.

***Polemonium viscosum* Nutt.** Common throughout cirque in talus and unstable sites on ledges; alpine. 2311; Ertter 2104.

Polygonaceae

***Eriogonum caespitosum* Nutt.** Uncommon on dry subalpine knoll north of Kane Lake. 2359.

***Eriogonum capistratum* Rev. var. *capistratum*.** Locally common in subalpine and alpine zones; dry, rocky slopes and ledges. 2360.

***Eriogonum ovalifolium* Nutt. var. *depressum* Blank.** Common in subalpine and alpine zones; dry, unstable slopes and ledges. 2249.

***Oxyria digyna* (L.) Hill.** Circumboreal. Common throughout cirque on moist, rocky slopes; alpine zone. 2286.

***Polygonum bistortoides* Pursh.** Common in moist to wet subalpine and alpine meadows. 2267.

***Polygonum kelloggii* Greene.** Uncommon in dry forest openings. 2390.

***Polygonum viriparum* L.** Common in moist alpine meadows. 2395; Caicco 477.

Portulacaceae

***Claytonia megarhiza* (Gray) Parry var. *megarhiza*.** Uncommon in alpine talus. 2404.

***Lewisia pygmaea* (Gray) Robins. var. *pygmaea*.** Common in dry subalpine and alpine sites. 2271, 2369.

Primulaceae

***Androsace septentrionalis* L.** Common on dry, sandy alpine slopes; circumboreal. 2353, 2422.

***Dodecatheon pulchellum* (Raf.) Merrill var. *watsonii* (Tidestrom) Hitchc.** Common in moist subalpine and alpine meadows. 2341.

Ranunculaceae

***Anemone parviflora* Michx.** Rare in moist alpine meadow south of Kane Lake. 2339.

***Aquilegia formosa* Fisch.** Common in moist, sloping meadows; subalpine and lower alpine zones. 2269; Caicco 472.

***Caltha leptosepala* DC. var. *leptosepala*.** Common throughout cirque in alpine and subalpine zones; wet meadows along streams and around lakes and ponds. 1181, 2298.

***Delphinium depauperatum* Nutt.** Uncommon in dry subalpine meadows north of Kane Lake. 2257.

***Ranunculus eschscholtzii* Schlecht. var. *eschscholtzii*.** Common throughout cirque on moist subalpine and alpine slopes. 2284; Ertter 2109.

***Ranunculus gelidus* Kar. & Kir.** Rare; seen only in moist alpine meadow at about 3170 m, along stream east of Kane Lake. 1182.

***Ranunculus pygmaeus* Wahlenb.** Circumpolar. Locally common in moist to wet sites in alpine zone; along rivulets, ledges, and cracks on rock face. 1110, 2315, 2346.

***Ranunculus verecundus* Robins.** Rare in moist alpine boulder field at 3050 m, southwest of Kane Lake. 2345.

Rosaceae

***Potentilla brevifolia* Nutt.** Locally common on dry alpine outcrops at 3050 m, southwest of Kane Lake. 2399.

***Potentilla diversifolia* Lehm. var. *diversifolia*.** Common throughout cirque in moist subalpine and alpine meadows. 2283, 2307, 2372.

***Potentilla fruticosa* L. [*Pentaphylloides floribunda* (Pursh) Löve].** Common on moist ledges and in boulder fields of subalpine and alpine zones; circumboreal. 1171, 2317.

***Potentilla glandulosa* Lindl. var. *pseudorupestris* (Rydb.) Breit.** Local on dry subalpine ledges. 2366.

***Potentilla nivea* L.** Circumpolar. Rare in alpine zone; seen only in moist, sloping meadow at head of waterfall south of Kane Lake. 2379.

***Rubus idaeus* L. var. *gracilipes* Jones.** Common in subalpine boulder fields. 2414.

***Sibbaldia procumbens* L.** Common in alpine and subalpine zones on moist, sandy slopes and ledges; circumboreal. 2288.

Salicaceae

***Salix arctica* Pall. var. *petraea* Andress.** Common throughout cirque in moist subalpine and alpine sites. 2276, 2342, 2376A, 2397; Ertter 2100.

***Salix* sp.** Only vegetative specimens obtained, but appears to be *S. castwoodiae* Cockerell ex Heller (S. Brunsfeld, University of Idaho, personal communication, 1991). Uncommon in wet subalpine meadow adjacent to the north shore of Kane Lake. 2386

***Salix niralis* Hook. var. *niralis*.** Rare on moist slopes in subalpine and alpine zones. 2337.

***Salix planifolia* Pursh.** Uncommon in subalpine meadow west of Kane Lake. 2266.

***Salix tweedyi* (Bebb) Ball.** Rare; only one robust plant seen at base of small cascade at 2865 m, west of Kane Lake; subalpine zone. 2421.

Saxifragaceae

***Heuchera cylindrica* Dougl. var. *alpina* Wats.** Common in subalpine and lower alpine zones on dry ledges and outcrops and moderately stabilized scree. 2239.

***Lithophragma bulbifera* Rydb. [*L. glabra* Nutt.].** Uncommon on moist subalpine slopes. 2370.

***Mitella pentandra* Hook.** Uncommon in lower alpine and subalpine zones; moist meadows and slopes. 2330.

***Parnassia fimbriata* Common. var. *fimbriata*.** Locally common in moist subalpine and alpine meadows. 1176; Caicco 283.

***Parnassia kotzebuei* Cham. var. *kotzebuei*.** Uncommon and local in gently to steeply sloping alpine meadows and on ledges. 2285, 2328; Caicco 280.

***Saxifraga adscendens* L. var. *oregonensis* (Raf.) Breit.** Uncommon in moist, sloping meadows and talus and along rivulets in alpine zone. 2331; Caicco 282.

***Saxifraga arguta* D. Don [*S. odontoloma* Piper].** Common along streams and rivulets in subalpine and lower alpine zones. 1178, 2335.

***Saxifraga cernua* L.** Uncommon and widely scattered in moist scree and sloping meadows and on ledges of alpine and subalpine zones; circumboreal. 2420.

***Saxifraga debilis* Engelm.** Common on moist and protected alpine ledges and slopes. 1108, 1109, 2324; Caicco 281; Ertter 2105.

***Saxifraga occidentalis* Wats. var. *occidentalis*.** Common in moist subalpine and alpine meadows. 2242, 2277, 2316, 2329, 2401.

***Saxifraga oppositifolia* L.** Common on moist alpine cliff faces; circumboreal. 2358.

Scrophulariaceae

***Castilleja miniata* Dougl.** Common in moist to wet subalpine and low alpine meadows. 2299.

***Mimulus tilingii* Regel var. *caespitosus* (Greene) Grant.** Common along alpine streams and rivulets. 1169.

***Penstemon procerus* Dougl. var. *formosus* (A. Nels.) Cronq.** Common in subalpine zone and uncommon in alpine zone on dry, rocky ledges. 2259.

***Veronica wormskjoldii* Roem. & Schult.** Common in moist to wet alpine and subalpine meadows. 1184, 2295.

Violaceae

***Viola adunca* Sm. var. *bellidifolia* (Greene) Harr.** Common in subalpine and alpine zones on moist meadows and slopes. 2290, 2371.

***Viola macloskeyi* Lloyd var. *macloskeyi*.** Common in wet subalpine meadow adjacent to Kane Lake. 2309.

CLASS LILIOPSIDA

Cyperaceae

***Carex atrata* L. var. *erecta* Boott.** Rare in moist soil of boulder field north of Kane Lake; subalpine. Ertter 2110.

***Carex capillaris* L.** Circumboreal. Uncommon in moist, steeply sloping meadow south of Kane Lake; lower alpine zone. 2332.

***Carex elynoides* Holm.** Uncommon on exposed alpine ledges east of Kane Lake. 2425.

***Carex haydeniana* Olney.** Common in moist subalpine and alpine meadows. 2278, 2431.

***Carex incurviformis* Mack. cf. var. *incurviformis*.** Rare; seen only in one small, steeply sloping, moist meadow at 3353 m, east of Kane Lake. 2411.

***Carex microptera* Mack.** Uncommon in moist subalpine meadows north of Kane Lake. 2383.

***Carex nova* Bailey.** Common in moist alpine meadows. 2291, 2428; Caicco 475.

***Carex phaeocephala* Piper.** Widely scattered in dry alpine sites. 1190, 2430; Ertter 2110A.

***Carex proposita* Mack.** Common on moist subalpine and alpine slopes. 2279.

***Carex rossii* Boott.** Uncommon in dry areas of forest understory. 2247.

***Carex scirpoidea* Michx. var. *pseudoscirpoidea* (Rydb.) Cronq.** Common on moist, sandy subalpine and alpine slopes. 1189, 2254, 2432; Caicco 473.

***Carex scopulorum* Holm var. *bracteosa* Hermann.** Common in wet meadows along creeks and around Kane Lake in subalpine and alpine zones. 2282.

***Carex subnigricans* Stacey.** Uncommon in moist alpine and subalpine meadows. 2429.

Juncaceae

***Juncus drummondii* E. Meyer var. *drummondii*.** Common in moist to dry, sandy soil of subalpine and alpine slopes. 2253, 2297.

***Juncus mertensianus* Bong.** Common in moist alpine meadows. 1195.

***Luzula parviflora* (Ehrh.) Desv.** Common in moist subalpine and low alpine meadows. 2320.

***Luzula spicata* (L.) DC.** Common on moist, unstable slopes of subalpine and alpine zones; circumboreal. 1197, 2323; Caicco 480; Ertter 2103.

Liliaceae

***Allium brandegei* Wats.** Rare in dry forest opening north of Kane Lake. 2394.

***Allium brevistylum* Wats.** Common in moist, steeply sloping meadows in subalpine and lower alpine zones. 2334.

***Calochortus eurycarpus* Wats.** Rare in dry areas of subalpine meadow north of Kane Lake. 2384.

***Zigadenus elegans* Pursh.** Common in moist, sloping alpine meadows. 2340; Caicco 478.

Poaceae

***Agropyron scribneri* Vasey [*Elymus scribneri* (Vasey) Jones].** Uncommon on dry, unstable alpine and subalpine slopes. 2272.

***Agrostis humilis* Vasey.** Uncommon on moist, sandy alpine ledges. 1196, 2368.

***Agrostis variabilis* Rydb.** Uncommon in moist alpine meadows. 1194.

***Calamagrostis purpurascens* R. Br.** Uncommon on dry, rocky subalpine and alpine ledges. 2365.

***Danthonia intermedia* Vasey.** Locally common in subalpine meadows north of Kane Lake. 2389.

***Deschampsia cespitosa* (L.) Beauv. var. *cespitosa*.** Common throughout cirque in subalpine and alpine moist meadows where it is often dominant; circumboreal. 1192, 2325; Caicco 481.

***Festuca idahoensis* Elmer var. *idahoensis*.** Uncommon in dry forest openings north of Kane Lake. 2241.

***Festuca orina* L. var. *brevifolia* (R. Br.) Wats. [*F. brachyphylla* Schult. & Schult.].** Uncommon in alpine zone; moist to dry meadows and ledges. 2273, 2407.

***Oryzopsis exigua* Thurb.** Common in dry subalpine sites north of Kane Lake. 2251.

***Phleum alpinum* L.** Common in wet to moist subalpine and alpine meadows; circumboreal. 1191, 2281.

***Poa alpina* L.** Common in wet to moist subalpine and alpine meadows. 2296.

***Poa cusickii* Vasey var. *cusickii*.** Uncommon in moist to dry subalpine meadows. 2296.

***Poa cusickii* Vasey var. *epilis* (Scribn.) Hitchc.** Uncommon in moist subalpine meadows. 2382.

***Poa gracillima* Vasey.** Uncommon on dry ledges in forest openings. 2238.

***Poa incurva* Scribn. & Will.** Uncommon in dry subalpine meadows. 2381.

***Poa interior* Rydb.** Uncommon on dry alpine slopes and in scree. 2426.

***Poa nervosa* (Hook.) Vasey var. *wheeleri* (Vasey) Hitchc.** Common on dry ledges and in forest understory north of Kane Lake. 2234.

***Poa rupicola* Nash.** Uncommon on dry, rocky alpine slopes. 2427.

***Sitanion hystrix* (Nutt.) Smith var. *hystrix* [*Elymus elymoides* (Raf.) Swezey].** Uncommon in subalpine and alpine zones on dry, rocky ledges and slopes. 2243.

***Trisetum spicatum* (L.) Richter.** Circumboreal. Common in alpine and subalpine zones; moist meadows and ledges. 2280.

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LITERATURE CITED

BAKER, F. S. 1944. Mountain climates of the western United States. Ecological Monographs 14:223–254.

BENSON, L. 1948. A treatise on the North American Ranunculi. American Midland Naturalist 40:1–264.

BRUNSFELD, S. J. 1981. Alpine flora of east-central Idaho. Unpublished thesis, University of Idaho, Moscow. 205 pp.

BRUNSFELD, S., S. CAICCO, AND D. HENDERSON 1983. Noteworthy collections of Idaho: *Parnassia kotzebuei.* Madroño 30:64.

BRUNSFELD, S. J., AND F. D. JOHNSON. 1985. Field guide to willows of east-central Idaho. Bulletin No. 39. Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow. 95 pp.

CAICCO, S. L. 1983. Alpine vegetation of the Copper Basin area, south-central Idaho. Unpublished thesis, University of Idaho, Moscow. 99 pp.

CAICCO, S., AND D. M. HENDERSON 1981. A survey of the rare plants of the Challis National Forest, Lost River District–West Side, with recommendations and management implications. University of Idaho Herbarium, University of Idaho, Moscow. 45 pp.

CAICCO, S., J. CIVILLE, AND D. HENDERSON 1983. Noteworthy collections of Idaho: *Astragalus leptaleus* and *Penstemon procerus* var. *formosus.* Madroño 30:64.

DAUBENMIRE, R. 1954. Alpine timberlines in the Americas and their interpretation. Butler University Botanical Studies 11:119–136.

DOVER, J. H. 1981. Geology of the Boulder-Pioneer Wilderness Study Area, Blaine and Custer counties, Idaho. Pages 16–75 *in* Mineral resources of the Boulder-Pioneer Wilderness Study Area, Blaine and Custer counties, Idaho. U.S. Geological Survey Bulletin 1497.

EVENSON, E. B., J. F. P. COTTER AND J. M. CLINCH 1982. Glaciation of the Pioneer Mountains: a proposed model for Idaho. Pages 653–665 *in* B. Bonnichsen and R. M. Breckenridge, eds., Cenozoic geology of Idaho. Idaho Bureau of Mines and Geology, Moscow.

GRIGGS, R. F. 1937. Timberlines as an indicator of climate trends. Science 85: 251–255.

HARTMAN, R. L., AND L. CONSTANCE 1985. Two new species of *Cymopterus* (Umbelliferae) from western North America. Brittonia 37:88–95.

HENDERSON, D. 1978. Notes on the flora of east-central Idaho. Madroño 25:172–174.

HENDERSON, D., S. BRUNSFELD, AND P. BRUNSFELD 1981. Noteworthy collections from Idaho: *Erigeron humilis, Hymenopappus filifolius* var. *idahoensis, Carex rupestris, Astragalus amnis-amissi, Gentiana propinqua,* and *Papaver khianense.* Madroño 28:88–90.

HERMANN, F. J. 1970. Manual of Carices of the Rocky Mountains and Colorado Basin. Agricultural Handbook No. 374. U.S. Department of Agriculture, Forest Service, Washington, D.C. 397 pp.

HITCHCOCK, C. L. 1941. A revision of the drabas of western North America. University of Washington Publications in Botany 11:1–132.

HITCHCOCK, C. L., AND A. CRONQUIST 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle. 730 pp.

JENKINS, R. E. 1986. Applications and use of biological survey data. Pages 141–152 *in* K. C. Kim and L. Knutson, eds., Foundations for a national biological survey. Association of Systematics Collections, Lawrence, Kansas.

LACKSHEWITZ, K., D. HENDERSON AND S. BRUNSFELD 1983. Noteworthy collections of Idaho and Montana: *Erigeron radicatus.* Madroño 60:64–65.

LESICA, P., AND J. S. SHELLY 1991. Sensitive, threatened, and endangered vascular plants of Montana. Occasional Publication No. 1. Montana Natural Heritage Program, Helena. 88 pp.

MOSELEY, R. K. 1985. Synecological relationships of alpine spike–fescue grasslands in east-central Idaho. Unpublished thesis, University of Idaho, Moscow. 70 pp.

———. 1989. Results of the 1989 search of regional herbaria for location information pertaining to Idaho's rare flora: the fourth generation search. Natural Heritage Section, Nongame and Endangered Wildlife Program, Idaho Department of Fish and Game, Boise. 12 pp.

MOSELEY, R., AND C. GROVES, COMPILERS 1990. Rare, threatened, and endangered plants and animals of Idaho. Natural Heritage Section, Nongame and Endangered Wildlife Program, Idaho Department of Fish and Game, Boise. 33 pp.

REVEAL, J. L. 1989. New combinations and novelties in *Eriogonum* (Polygonaceae: Eriogonoideae). Phytologia 66:251–265.

WARDLE, P. 1974. Alpine timberlines. Pages 371–402 *in* J. D. Ives and R. G. Berry, eds., Arctic and alpine environments. Methuen and Co., Inc., London.

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